

What is claimed is:

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A1
1. A method of manufacturing a semiconductor device comprising:
- 5 a first step of depositing a first film and a second film on a conductive layer in this order and etching a desired portion of the second film with a first etching gas until the first film is exposed, the first film being made of one of a silicon nitride film and a silicon nitride oxide film, the second film
- 10 being made of a silicon oxide film;
- a second step of removing a reaction product deposited on the first film through the first step with a second etching gas to expose the first film;
- a third step of etching the first film exposed through
- 15 the second step with a third etching gas until the conductive layer is exposed; and
- a fourth step of removing a reaction product deposited on the conductive layer through the third step with a fourth etching gas, thereby forming a concave portion penetrating the
- 20 first and second films to reach the conductive layer surface.
2. A method according to claim 1, wherein the first, second, third and fourth steps are successively carried out in a single apparatus maintaining therein a vacuum state.

3. A method according to claim 1, wherein the first etching gas contains at least one of CHF_3 , C_4F_8 and C_5F_8 .
4. A method according to claim 1, wherein the third etching gas contains at least one of CHF_3 and CH_2F_2 .
5. A method according to claim 1, wherein the second and fourth etching gases contain O_2 and the etching in the second and fourth steps is carried out under plasma conditions.
6. A method according to claim 1, wherein the conductive layer is a silicon substrate and the concave portion is a contact hole.
7. A method according to claim 1, wherein the conductive layer is a layered substrate on which an electrode is layered and the concave portion is a via hole.

Add A2